



## **Leak First, Fix Later** **Uncontrolled and Unmonitored Radioactive Releases from** **Nuclear Power Plants**

*A Beyond Nuclear Report*  
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### **EXECUTIVE SUMMARY**

The highly-publicized leaks of radioactive hydrogen – or tritium – from buried pipes at the Braidwood, Oyster Creek and Vermont Yankee nuclear power plants have drawn attention to a more widespread and longstanding problem analyzed by a new report from Beyond Nuclear. *Leak First, Fix Later: Uncontrolled and Unmonitored Radioactive Releases from Nuclear Power Plants* finds leaking U.S. reactors are now ubiquitous. There is evidence of 15 radioactive leaks from March 2009 through April 16, 2010 from buried pipe systems at [13 different reactor sites](#). At least 102 reactor units are now [documented](#) to have had recurring radioactive leaks into groundwater from 1963 through February 2009.

The report finds that the federal regulator – the U.S. Nuclear Regulatory Commission (NRC) – has replaced its own oversight responsibilities in favor of industry self-regulation. Instead of mandating compliance with established license requirements for the control and monitoring of buried pipe systems carrying radioactive effluent, the NRC cedes responsibility to industry voluntary initiatives that will add years onto the resolution of a decades-old environmental and public health issue. Of further concern, the agency and the industry continue to downplay and trivialize the health risks of prolonged exposure to tritium which is shown to cause cancer, genetic mutations and birth defects.

The delinquency of the NRC is made more alarming by the fact that the nuclear industry has deliberately misrepresented the truth about its leaking reactors to state governments, most dramatically in Illinois and Vermont. Given the history of untrustworthiness of the nuclear industry, it is even more important to have a vigilant and responsible regulator. The report found this not to be the case with the NRC and its oversight of increasing leaky reactors.

The report examines radioactive leaks in Illinois, New Jersey, Michigan, New York and Vermont that illuminate concerns over continuing groundwater contamination, the accelerating deterioration of buried pipes, the lack of integrity of industry's reporting of leaks and pipes and the questionable replacement of federal oversight and enforcement with industry "voluntary initiatives."

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Large quantities of tritiated water have leaked into groundwater, inevitably migrating to surface and drinking water sources. Tritium escapes through leaking underground or buried pipes, or is vented to the atmosphere, falling back to earth as precipitation.

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So-called “permissible” doses of tritium – standards established by the Environmental Protection Agency at 20,000 picocuries per liter of tritium – do not take into account the most vulnerable among our population, especially pregnant women and their unborn children. “Permissible” doses of tritium – which does not necessarily mean “safe” – are based on what could be tolerated by a robust adult male. The report argues that these standards need to be far more protective as

already established in safe drinking water goals for the State of California at 400 picocuries per liter and the State of Colorado at 500 picocuries per liter.

During the normal operation of a nuclear power plant, radioactive by-products build up in the reactor fuel and escape into the reactor’s cooling water and steam. Contaminated reactor cooling water is periodically processed before being recycled back to the reactor vessel. Some of the processed coolant is discharged in batches to the river, lake or ocean used as the cooling water source. Routine releases of this processed cooling water contain diluted radioactive water that includes traces of dissolved and entrained radioactive by-products. More effluent in the form of radioactive gases is vented or purged directly to the atmosphere. The management and disposal of this radioactive effluent occurs within a network of pipe systems and holding tanks.

Depending on its location to a cooling water source and discharge point, a typical nuclear power plant has anywhere from two to 20 miles of buried pipes in a tangle of 30 to 50 separate systems carrying radioactive water and steam beneath the power plant property.

The United States Nuclear Commission (NRC) has established [license requirements](#) for each nuclear power plant operator to control and monitor the radioactive effluent in these piping systems in The Code of Federal Regulation Chapter 10 Part 50 Appendix A, General Design Criteria 60 and 64.

As the result of recurring leaks in 1979, the NRC notified the nuclear industry of the need for the [“Prevention of Unplanned Releases of Radioactivity”](#) from reactors. The industry largely ignored the NRC call. Buried pipe systems carrying radioactive water largely remain inaccessible, uninspected, unmaintained and inevitable accidental leaks go uncontained. Instead, the NRC has

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replaced its regulatory oversight over the loss of control and monitoring of radioactive effluent in buried pipes with nuclear industry “voluntary initiatives” for reporting [contamination of groundwater](#) and [deteriorating buried pipes](#) overseen by the Nuclear Energy Institute, the industry’s lobby group and trouble shooter.

The bulk of both the [controlled](#) and uncontrolled radioactive releases from nuclear power plants are in the form of radioactive hydrogen, tritium and tritiated water, which is generated in significant concentrations of tritium at nuclear power plants.

Tritium as a gas (HT) and as tritiated water (HTO) will displace hydrogen and water molecules. Hydrogen is by far the most common element in the makeup of a DNA molecule. Tritium is often mischaracterized as a “weak” beta-emitting radioactive particle. Tritium in fact is a “low-range” beta emitter and highly radioactive. The “specific activity”, the amount of radioactivity per weight measure of an isotope, of a pure gram of tritium is 9,800 curies, where a gram of strontium-90 is 140 curies and cobalt-60, a strong and penetrating gamma radiation emitter is 10,100 curies per gram. Tritium is clinically shown to be [more effective](#) at damaging and destroying living cells than gamma rays. Tritium is a [biological hazard](#) and known to cause cancer, birth defects and genetic damage. Moreover, the federal “permissible” level for tritium exposure in drinking water varies significantly with some state protective health goals raising a controversy.

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Braidwood nuclear power station (IL) had 22 recurring uncontrolled radioactive spills from unmaintained vacuum breaker valves on the same buried pipeline that went undisclosed from 1996 to December 2005 including two releases totaling six million gallons of tritiated water. The Braidwood operators allowed millions of gallons of radioactive water contaminated with tritium to soak into groundwater along the four and a half-mile long pipe and to run off site into the neighboring community of Godley Park Township where 600 people have been supplied with bottled water provided by Exelon for more than four years. The city of Wilmington takes in its drinking water from the Kankakee River just two and a half miles from the same Braidwood discharge pipe.

Oyster Creek nuclear power plant (NJ) disclosed radioactive water leaking from buried pipes just seven days after the NRC awarded the oldest reactor in the US a 20-year license renewal. The leaking buried pipes had been falsely documented in company work orders. Management decisions made in the 1990s to close Oyster Creek cancelled numerous corrective actions for

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buried pipes carrying radioactive water. When the reactor was instead sold, many of the work orders were never resumed. The unmanaged deterioration of aging systems sounds an alarm about the thoroughness and adequacy of the NRC license extension review process.

Vermont Yankee nuclear power station (VT) is seeking a 20-year license extension. A January 6, 2010 lab report identified a “very low concentration of tritium” in an on-site test well. The

***The nuclear industry admits that radioactive leaks into groundwater from buried pipes are illegal.***

reading spiked from 700 picocuries per liter to 2.7 million picocuries per liter as more test wells were dug to find the leak. Cobalt-60, cesium-137 and radioactive manganese and zinc were discovered in the leak path indicating that the contamination started with fuel damage. The company destroyed its credibility when it revealed that officials falsely reported in sworn testimony to state regulators that there

were no buried pipes carrying radioactive water under the reactor. The state senate voted 26 to 4 to close the reactor at the end of its current license in 2012 effectively setting up a legal roadblock to NRC relicensing.

The nuclear industry admits that radioactive leaks into groundwater from buried pipes are illegal. Constellation Energy, that operates reactors in Maryland and New York, [recognized](#) that “*The true risk is legal. The plants do not have legal authorization to release radioactive material to the groundwater. Groundwater flows through and off the plant property, potentially contaminating private property.*” More bluntly, “*You have put your radioactive waste on my property and damaged my property value.*”

Examples of non-disclosure, false reporting and possibly perjury strongly support the case that an industry in part unable to tell the truth, the whole truth and nothing but the truth should not be allowed to self-regulate on matters of protecting water quality and public health through “voluntary” initiatives.

The industry’s “Voluntary Groundwater Protection Initiative” came about with the unraveling of undisclosed leaks at reactors in Illinois. Public and political pressure culminated in federal legislation drafted in 2006 by U.S. Senator Barack Obama (IL) mandating the immediate reporting of radioactive leaks from nuclear power plants to include the local community. The bill stalled and failed. But the Nuclear Energy Institute concluded that they needed to take the initiative or the NRC was going to have to become a stronger regulator. The industry initiative volunteers reporting leaks to groundwater that had been previously unreported and some

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piecemeal changes but mandates no proactive measure to actually protect groundwater from still largely inaccessible and deteriorating buried pipe systems.

A second voluntary initiative offered by the Nuclear Energy Institute, the “Buried Pipe Integrity Program,” was offered in October 2009 following another series of pipe leaks and recurring groundwater contamination events. This initiative offers to provide “reasonable assurance of structural and leakage integrity of all buried pipe with special emphasis on piping that contains radioactive materials.” However, the NEI initiative plans to add years more onto a decades-old problem. The initiative’s schedule does not announce its proposed management plan until December 31, 2013. In fact, the industry’s “buried pipe integrity” program is a contradiction in terms. Buried pipe remains inaccessible to monitoring of the effects of aging, corrosion and other forms of attack, diminishing the reliability of determining its future integrity. Ironically, on the same day that NEI laid out industry’s three year study plan, the operators of Oyster Creek volunteered to replace all of its buried pipes carrying radioactive water by the end of 2010 with corrosion-resistant pipes installed in above-ground vaults so that pipes carrying radioactive water can be proactively inspected, monitored, maintained and contained if a leak occurs.

The Beyond Nuclear report “*Leak First, Fix Later*,” makes a set of recommendations in the following areas for the timely resolution of ground- and surface water contamination coming from buried pipes at nuclear power plants;

1. Regulatory oversight, authority and enforcement must be strengthened;
2. Buried pipes must be promptly replaced so that systems carrying radioactive effluent can be inspected, monitored, maintained and contained in the event of a leak;
3. The nuclear industry must be held accountable for radioactive releases to air, water and soil;
4. There must be more public transparency describing the source, cause and extent of radioactive releases from nuclear power plants; and
5. Radiation protection standards must be strengthened and applied consistently nationwide.

The Beyond Nuclear report “*Leak First, Fix Later: Uncontrolled and Unmonitored Radioactive Releases From Nuclear Power Plants*” can be viewed in its entirety at [www.beyondnuclear.org](http://www.beyondnuclear.org). A PDF copy of the [full report](http://www.beyondnuclear.org/storage/documents/LeakFirst_FixLater_BeyondNuclear_April182010_FI_NAL.pdf) can be downloaded here - [http://www.beyondnuclear.org/storage/documents/LeakFirst\\_FixLater\\_BeyondNuclear\\_April182010\\_FI\\_NAL.pdf](http://www.beyondnuclear.org/storage/documents/LeakFirst_FixLater_BeyondNuclear_April182010_FI_NAL.pdf)



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Beyond Nuclear aims to educate and activate the public about the connections between nuclear power and nuclear weapons and the need to abandon both to safeguard our future. Beyond Nuclear advocates for an energy future that is sustainable, benign and democratic. The Beyond Nuclear team works with diverse partners and allies to provide the public, government officials, and the media with the critical information necessary to move humanity toward a world beyond nuclear.

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